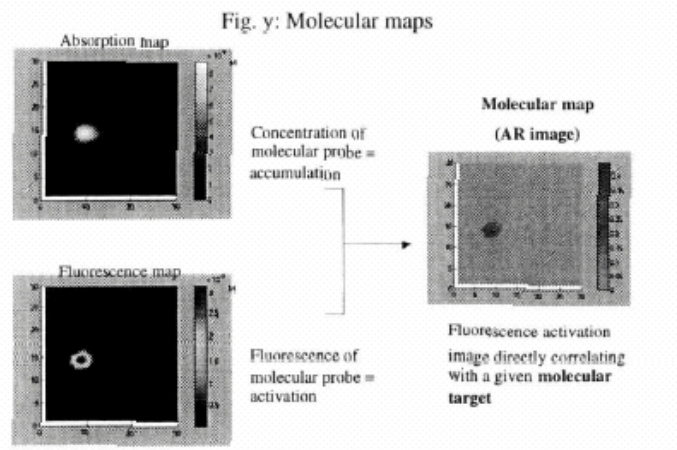


Molecular Beacons and Hand-Held Sensors

Ralph Weissleder, Massachusetts General Hospital

Biomolecular Systems Research Program



Reconstructed images showing targeted molecular probe cathepsin B enzyme activity.

Description

Develop novel enzyme activate molecular beacons for targeted recognition.

Add photo activated release of singlet oxygen as local therapeutic.

Develop and improve existing algorithms of diffuse optical tomography to provide deep tissue imaging of targets.

Innovative Claims/NASA Significance

The use of enzyme activatable imaging probes has been pioneered by the PI over the last two years and used to image protein function *in vivo*. The developed beacons rely on a dual amplification strategy a) chemical amplification: a ten to thousand fold increase in optical signal as the probes are activated by specific enzymes and b) biological amplification: the fact one enzyme can activate many probe molecules.

Imaging enzyme activities (rather than the presence of a protein) *in vivo* has been used to detect cancers much earlier than previously possible and has enabled real time molecular target assessment of inhibitor treatments hitherto not possible. The proposed hand-held “molecular scanner”, using the molecular beacon technology, is very innovative.

Plans

Year 1

1. Probe synthesis
2. Optical sensor design
3. In-vivo testing

Year 2

1. Probe synthesis
2. Build imaging system

Year 3

1. Probe refinement
2. In-vivo testing of imaging system